Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

The role of contact forces in rheology of hard-sphere colloidal suspensions SAFA JAMALI, ARMAN BOROMAND, JOAO MAIA, Dept. of Macromolecular Science and Engineering, Case Western Reserve University — Dense colloidal suspensions show a wide range of non-Newtonian behavior in response to the flow. While at low and intermediate shear rates the fluid shear-thins, increasing the shear rate above a critical rate gives rise to microstructural changes in the fluid and consequently shear-thickening. It is widely accepted that shear-thickening of a suspension is due to the short-range hydrodynamics (so-called lubrication) forces between colloidal particles which consequently gives rise to formation of hydro clusters that resist against the flow. However, computational efforts based on lubrication theory have not been able to explain discontinuous shear-thickening in suspensions. Recently, some reports have incorporated contact potentials and their dissipative role in colloidal interactions and have successfully reproduced higher viscosity ratios at high shear rates in the shear-thickening regime. We study the effect of contact forces and lubrication potential in rheological behavior of the colloidal suspensions. To do so, we have modified Dissipative Particle Dynamics (DPD) method in order to include the lubrication potentials. Furthermore, different types of contact potentials have been included in our DPD potentials in order to understand the physical nature of contact forces and their effect on the rheology of suspensions. Finally, efforts will be made in order to correlate the microstructural changes and different types of interactions to macroscopic flow behavior of suspensions.

Safa Jamali
Case Western Reserve Univ

Date submitted: 01 Aug 2014 Electronic form version 1.4